UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Advanced Subsidiary Level and GCE Advanced Level

MARK SCHEME for the May/June 2009 question paper

for the guidance of teachers

9693 MARINE SCIENCE

9693/03 Paper 3 (A2 Structured Questions), maximum raw mark 75

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes must be read in conjunction with the question papers and the report on the examination.

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Mark scheme abbreviations:

;	separates marking points
/	alternative answers for the same point
R	reject
A	accept (for answers correctly cued by the question, or guidance for examiners)
AW	alternative wording (where responses vary more than usual)
Underline	actual word given must be used by candidate (grammatical variants excepted)
max	indicates the maximum number of marks that can be given

1 (a) (i) 1. cyanobacteria;
2. diatom; [2]

(ii) 2 of:
light needed for photosynthesis;
light is absorbed/scattered in water;
below 80 m the amount of light may be insufficient for photosynthesis/ref. to compensation point; [2]

(iii) use carbon dioxide in photosynthesis;
fix carbon into organic molecules/named molecules;
form the basis of food chains and webs in the oceans; [3]

(b) (i) 1 × 2 of:
do not allow answers in context of photosynthesis only
Either:
increase productivity;
more carbon dioxide available for photosynthesis;
Or:
decrease productivity;
lower/changed pH may decrease carbon dioxide assimilation; [2]

(ii) 3 of:
may reduce pH as acidic gas;
may affect enzyme activity;
some species now able to compete better for minerals/carbon dioxide;
balance in food web changes so some increase/reduce in number;
do not allow general reference to increase or decrease in biodiversity [3]

[Total: 12]

2 (a) (i) maintaining a constant water **and** salt/ion content;
in body <u>fluids/blood;</u> *Reject body unqualified* [2]

(ii) ref. to idea that:
sea water has more ions/less water/lower water potential than body fluids;
water is lost from the body surface **and** gills by osmosis; [2]

(b) (i) 3 of:
in sea water the concentration of sodium and chloride ions is higher than in/body fluids;
smaller osmotic difference between sea water and blood/body fluids;
reduces the loss of water by osmosis;
drink sea water to replace water loss;
excess salts taken in when drinking excreted by gills;
Ignore any references to osmoregulation in fresh water [3]

(ii) excretion of excess salts occurs by active transport;
requires oxygen for respiration to provide ATP/energy; [2]

(iii) has increased its blood concentration to the same osmotic concentration as sea water;
(tolerates) higher levels of urea; [2]

[Total: 11]

3 (a) 3 of:
Ignore references to advantages of internal development
fewer eggs/sperm needed;
fewer eggs/sperm lost;
increased chance of fertilisation;
less energy needed to produce fewer eggs/sperm; [3]

(b) 5 of:
viviparous/blue shark has higher chance of survival;
protected within female/provided with food;
ovoviparous/great white shark has least chance of survival;
(protected within female) but likely to eat each other as develop;
oviparous/zebra shark has no protection by female/parent;
some lost to predators;
run out of food in the egg; [5]

[Total: 8]

4 (a) (i) progressive reduction in the fish stocks; [1]

(ii) 4 of:
overfishing;
too many young fish being caught before reproductive age;
insufficient breeding stock to replace losses;
recruitment too low;
increased use of modern technology/example, to locate shoals/increase catch;
insufficient monitoring of quotas;
allow ref. to difficulty of enforcing legislation [4]

(iii) 2 × 2 of:
quota system/fishing at MSY;
restricts the number of fish/age of fish caught, so more left in stock;
ref. to mesh size of nets used;
fewer small fish caught, so increases breeding potential;
restriction on time/location;
fish not caught during breeding season/in breeding grounds, increasing reproductive stock;
reduced fishing intensity;
fewer boats/size of boats/number of fishing trips, so less fish caught; [4]

(b) short term, 1 of:
loss of employment;
financial hardship;
contract/business losses in fish marketing;

long term, 1 of:
sustainable industry;
long term employment for fewer people;
population loss as move to other areas to seek employment; [2]

[Total: 11]

5 (a) (i) 1. kill any bacteria that may be in the water/eggs (to reduces losses); [1]
2. symbiotic organisms with giant clams/food supply; [1]
3. provide oxygen for respiration; [1]

(ii) 1 of:
zooxanthellae may provide some food;
water contains sufficient nutrient;
reserves left in eggs; [1]

(b) (i) 2 of:
Must make a comparison of the two systems

Larvae system	*Seed clam system*
totally enclosed	natural environment;
treated with antibiotics	no added chemicals/medicines;
may be supplied food	food from sea;
artificial oxygenation	oxygen from sea; [2]

(ii) 1 of:
protect from predators;
protect from strong wave action;
easy to access/deep diving not necessary; [1]

[Total: 7]

6 (a) (i) 2 of:
incomplete combustion of gases from oil extraction;
evaporation from tankers;
evaporation from oil refineries; [2]

(ii) $\frac{0.16}{5.95} \times 100$;
= 2.69 (allow 2.7);
allow 1 mark if include 0.16 in the total (6.11) [2]

(b) (i) 4 of:
the *Sinclair Petrolore* (caught fire so) some of the oil would burn;
currents may have swept the oil out to sea where is could disperse;
the *Braer* (was in a hurricane so) wave action breaks up the oil;
spread out in small quantities so can be broken down easily by microbial action/natural processes;
the *Exxon Valdez* (ran aground so) oil onto the land and close to the coast;
(oil) would be easily washed ashore causing pollution; [4]

(ii) 2 of:
oil covers water/plants;
blocks light so unable to/reduced ability to photosynthesise (kills plants);
toxic/corrosive content kills the plants;
coats rocks so new plants unable to attach; [2]

[Total: 10]

7 (a) ref. to: the idea of maintaining biodiversity;
ref. to: management/protection of the environment by humans; [2]

(b) 2 of:
minimises the effect of tourism on the environment;
encourages recycling/sustainability;
energy conservation;
preserves cultural integrity//identity of local peoples;
creates employment/economic opportunities for local people;
allow examples e.g. local craft shop [2]

(c) (i) 2 of idea of:
roads/transport to bring in tourists/food supplies/waste removal;
providing accommodation/campsites/hotels;
developing/building power supply lines/generators;
building/providing sanitation/clean water systems;
Allow examples of any of the above contexts [2]

(ii) 2 of idea:
loss of habitat may result in extinction of species that attract tourists;
organic waste from food/faeces may attract vermin/new species that compete with the existing species;
waste water and sewage may pollute rivers causing eutrophication/ contamination of drinking water for the local people;
litter left in the environment causes death of plants/animals;
excessive use of water by tourists may cause water shortages to local people;
local people may be forced to leave due to loss of land for tourist support;
taking souvenirs encourages exploitation of rare species/damage to physical environment;
Allow examples of any of the above contexts [2]

[Total: 8]

8 (a) (i) Turn on the gene that codes for growth hormone; [1]

(ii) Genes cannot be accurately placed in the genome, ensures both are together; [1]

(iii) DNA/nucleus; [1]

(b) (i) 2 of:
grow faster so more yield/food;
reduced the cost of fish as can be sold sooner;
reduced cost of production as ready sooner;
produced more rapidly than by selective breeding; [2]

(ii) 3 of;
increases competition;
for food, so insufficient for all;
breeding sites, fewer wild reproduce;
interbreeding may transfer modified genes to wild population;
genetically modified fish grow so fast they out compete wild fish; [3]

[Total: 8]